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Contact melting materials with non-linear properties

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Abstract

The effects of nonlinear thermophysical properties on thermal and flow fields of the molten thin layer produced by contact melting are investigated. The molten layer is assumed to be a non-Newtonian fluid which has temperature-dependent viscosity and thermal conductivity. Heat transfer to solid and temperature field in solid with temperature-dependent conductivity are obtained. Choosing the heating surface of parabolic shape significantly reduce calculations, since closed-form solutions are obtained. Closed-form solutions for velocity, temperature, pressure, and thickness of the molten layer, and criterions to indicate the importance of taking into account the effects of nonlinear properties are provided.